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Producing Green melon Juice by Using Rind of *Citrullus Lanatus*

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Watermelon (*Citrullus lanatus)* skin normally looked as scraps. Less people know that watermelon skin contains various nutrients. Looking at its potential and benefits to health, a research conducted to produce juice made from the inner thick layer of watermelon skin. Therefore, objectives of this study are to determine the nutrition contents and the acceptance level of respondents towards the juice. The Gas Chromatography – Mass Spectrophotometry (GC-MS) used to detect antioxidant activity. Hedonic scale used as the quantitative instrument. 30 respondents were selected randomly based on their locality. Descriptive analysis used to analyze data collected using SPSS version 22.0. This study indicates the presence of antioxidant activity is at 5.46% while the fat content is low at 0.2g/100g. Result also shows the acceptance level of respondents towards the juice made from inner thick layer of watermelon skin is 3.48 of average mean value. In conclusion, juice made from inner thick layer of watermelon skin contains antioxidant and accepted optimistically.

Key-word: - watermelon rind, antioxidant, hedonic scale, Citrullus lanatus

1. Introduction

The increasing number of municipal solid waste management has become the biggest environmental problem in Malaysia (M. O. Saeed, et al., 2009). According to Bello IA, Ismail MNB, Kabbashi NA (2016), solid wastes is defined as non-liquid or nongaseous products (e.g. trash, junk and or refuse) of human activities that are unwanted produced by the industrial, agricultural, mining, business from home end domestic. While Lim, W. J. et al (2016) indicates that food waste sources can be sorted into three groups which are food losses, i.e. food materials lost during preparation, processing and production phases in the food supply chain, unavoidable food waste, i.e. the inedible parts of food materials lost during consumption phase (watermelon rind, fruit core, etc) and avoidable food waste, i.e. the edible food materials that were lost during consumption phase (surplus and wastage).

Currently, about 11,750 hectares of agricultural land are currently under cultivation covering Rompin and Johor producing over 239,050 tones annually for export and local consumption (Anem, 2010; Souad et. al., 2012). In recent times, there have been challenges in agro-wastes management due to yearly increase in production in perishable fruits which does not commensurate with consumer utilization (Apsara and Pushpalatha, 2002; Souad et. al., 2012). Hence more wholesome fruit are discarded indiscriminately in the environment. This development makes reuse and value addition of agro- waste a viable methodology capable of reducing their environmental impact. As stated by Souad, A.M., Jamal, P. and Olorunnisola, K. S (2012), watermelon waste materials remained one of the important food grade agro-wastes generated by most hospitality industries in Southeast Asia and particularly in Malaysia.

Watermelon (*Citrullus lanatus*) is a tropical fruit widely consumed around the world and particularly among Malaysians. It botanically considered as a fruit, belongs to the family Cucurbitaceae (Edwards et al., 2003). Its first harvest was documented 5000 years ago in Egypt that later spread to other part of the world. Presently, China is the top producer followed by Turkey, United States, Iran and Republics of Korea (Zohary and Hopf, 2000; Lucier and Lin, 2001; Naz et al., 2013). Watermelon is a valued source of natural antioxidants with special reference to lycopene, ascorbic acid and citruline. These functional ingredients act as protection against chronic health problems like cancer insurgence and cardiovascular disorders (Zhang and Hamauzu, 2004; Omoni and Aluko, 2005; Fenko et al., 2009).

Table 1: Botanical classification of watermelon

Kingdom	*Plantae* – Plant
Subkingdom	*Tracheobionta* - Vascular plants
Superdivision	*Spermatophyta* - Seed plants
Division	*Magnoliophyta* - Flowering plants
Class	*Magnoliosida* – Dicotyledons
Order	*Cucurbit ales*
Family	*Cucurbitaceae*
Genus	*Citrullus*
Species	*Citrullus lanatus*

(Ambreen et. al., 2014)

Nutritionally, every aspect of the fruit of watermelon has value, including the rind and the seeds (Erhirhie and Ekene, 2013). *Citrullus lanatus* contains about 6% sugar and 92% water by weight. As with many other fruits, it is a source of vitamin C. The composition of dried seed without shell per 100 g include: water 5.1 g, energy 2340 kJ (557 kcal), protein 28.3 g, fat 47.4 g, carbohydrate 15.3 g, Calcium 54 mg, Phosphorous 755 mg, iron 7.3 mg, thiamin 0.19 mg, riboflavin 0.15 mg, niacin 3.55 mg and folate 58 µg. The seed being an excellent source of energy and contains no hydrocyanic acid, making it suitable as livestock feed. The seed oil contains glycosides of linoleic, oleic, palmitic and stearic acids. The fruit flesh contains bitter cucurbitacins (Schippers, 2002). Additionally, watermelon is rich source of β-carotene acts as an antioxidant and precursor of vitamin A.

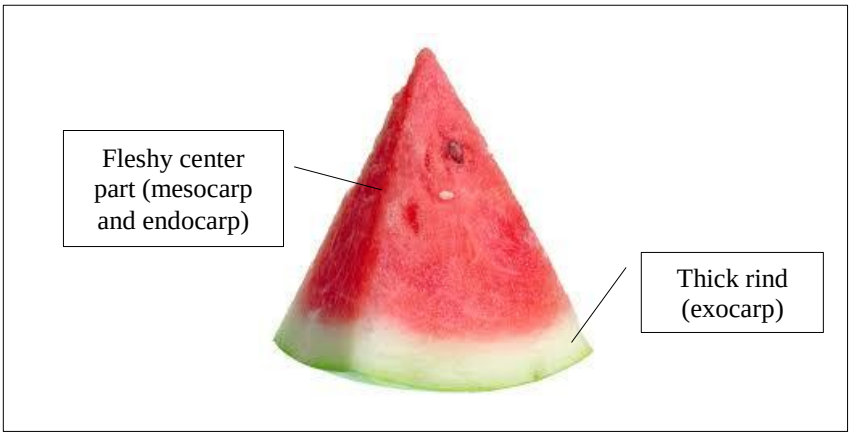

Figure 1 : Parts of watermelon *(Citrullus lanatus)*

The rind contains impressive concentrations of most nutrients like phenolic antioxidants, flavonoids and lycopene (Ambreen et. al., 2014). However, reports of juice made from watermelon rind (WMR) waste is scarce showing that watermelon wastes from restaurants, food and beverages processing lines are scantly being reused. WMR is one of the major solid wastes generated by several restaurants, cottage fruit juice producers and food industries in Malaysia. Unfortunately, more than 90% of the rind is discarded indiscriminately into the environment thereby constituting environmental challenges. This waste rind is not presently being utilized for any value added processes due to limited research activities focusing on the possible conversion of the waste to other valuable products thereby making it available for dumping as solid waste (Souad et. al., 2014). This novel use of WMR will among other things reduce the amount of the waste discarded, create more income for farmers, food processors and more importantly reduce environmental impacts of the waste. Therefore, the main focus of this research paper is to successfully document the nutrition content and sensory characteristics of juice made from WMR.

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2. Methodology

Fruit waste collection

Fresh watermelon wastes (rind only); WMR with similar physical characteristics were collected from local juice processing restaurants located at Merlimau, Melaka area. The WMR are collected between 9 am and 12 noon in order to maintain their natural content before being stored immediately after collection at 4$_o$C to avoid any chemical deterioration before processing day.

Juice preparation and bottling

The outer most skin of the exocarp of WMR were peeled with a peeler. Then, 250 g of the rind were cut into small pieces. Next, pieces of the collected rind of *Citrullus lanatus* were maceration with blender at room temperature. Finally, the liquids were collected in a beaker. It is the crude extract. 0.2ml drop of Stevia extract were added into the WMR liquid. Glass bottle and cap were boiled for 15minutes for sterilization process. 150ml of WMR juice then poured into the bottle once it reached room temperature. Cap is then sealed tightly.

Sensory evaluation

WMR juice sample for organoleptic evaluation were prepared aseptically in clean transparent disposable closed containers and served fresh on the test day. Thirty untrained member panel (twenty five men and three women) were selected from the university community among postgraduate students, evaluated sensory characteristics (taste, smell, colour, sweetness and colour) of the samples using a 5-point hedonic scale ranging from dislike extremely (1) to like extremely (5) (John *et al*., 2007 in Souad *et al*., 2012). During product testing, panel memberswere allowed to clean their mouth at intervals.

Table 1: Sensory evaluation questionnaire

5	4	3	2	1
 Like very much	 Like a little	 Not sure	 Dislike a little	 Dislike very much
Color				
Taste				
Flavors				
Smell				

Nutrition content

Nutrition content of the WMR juice was conducted using the Gas Chromatography – Mass Spectrophotometry (GC-MS). Tested parameters are moisture, crude ash, total fat content, crude protein content, total carbohydrate, energy content, total sugar and antioxidant activity. 250ml of green melon juice was used to perform the tests.

Statistical analysis

Sensory characteristics data of the WMR juice were analysed using SPSS version 22. Mean values were detemined by referring to the mean value range interpretation (Sekaran, 1992).

Table 2: Mean interpretation

MIN SCORE	INTERPRETATION	LEVEL
1.00 until 2.49	Low	Weak
2.50 until 3.49	Medium	Medium
3.50 until 5.00	High	Good

(Sekaran, 1992)

3. Result and Discussion

Objective (i): Determine the acceptance level of respondents towards Green melon juice.

Analysis showed that the respondents highly accepted the Green melon juice with overall mean value 3.52. Respondents strongly agree that the juice has good taste, colour, flavour and texture with mean value 3.81, 3.48, 3.67, 3.59 respectively. Table 3 indicates the mean score for each attribute evaluated.

Table 3: Respondents acceptance level towards Green melon juice

	Mean	Interpretation	Level
Colour	3.48	High	High
Taste	3.81	High	High
Flavour	3.67	High	High
Smell	3.05	Medium	Medium
Texture	3.59	High	High

Objective (ii): Determine nutrition value of Green melon juice.

Result indicated that there is a presence of antioxidant activity by 9.5% in the green melon juice. The moisture content of green melon juice is 97.7g/100g, while crude ash is 0.6g/100g. The total fat and crude protein content are 0.2g/100g and 0.15g/100g respectively. There are 1.3g/100g amount of carbohydrate presence in the sample and each 100ml juice provides 8kcal of energy. The total sugar presence in the green melon juice is at 5.46%

Table 4: Nutrition analysis result of Green melon juice

Test Parameter	Unit	Result
Moisture	g/100g	97.7
Crude ash	g/100g	0.6
Total fat content	g/100g	0.2
Crude protein content	g/100g	0.15
Total carbohydrate	g/100g	1.3
Energy content	kcal/100g	8
Total sugar	%	5.46
Antioxidant activity	%	9.5

(Malacca Institute of Biotechnology, 2012)

4. Conclusion

In conclusion, the green melon juice produced from WMR is highly accepted by respondents and there is presence of antioxidant activity in the juice along with crude protein, carbohydrate, fat and sugar content.

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